9678

Tooele Army Depot—North Area
Phase II Remedial Investigation

Final Letter Work Plan
for
Additional Fieldwork - SWMUs 6, 8, and 40

December 1995

Rust Environment and Infrastructure
Grand Junction, Colorado 81506

Prepared for
U.S. Army Environmental Center
Aberdeen Proving Ground, Maryland 21010-5401
Under Contract No. DAAA15-90-0007

Comment	Response to Comment
USEPA, Region VIII	
EPA Specific Comments	
1. Section 2.1.2. and 2.3.3. Include in the report the amount and type of UXO removed from SWMU 6 and SWMU 40.	The next version of the RI Addendum Report will include an inventory of UXO identified and removed or destroyed in place for SWMUs 6 and 40 as requested.
2. Appendix A. Are there any metals included in the propellant mixtures that could shed some light on the source of some of the metals found at SWMU 40?	On the basis of information received from the Ammunition Equipment Directorate of TEAD, it appears the metals are not a major component of any kind of propellant found at SWMU 40. This information will be added as a table to the next version of the RI Addendum Report.
State of Utah - Department of Environmental Quality, Division of Environmental Response and Remediation	
State of Utah Specific Comments	
We have reviewed the Final Draft Letter Workplan for Additional Fieldwork - SWMUs 6, 8, and 40. The area north of the gullies has been included for additional sampling at SWMU 6. However, the samples are to be analyzed only for dioxins and furans. Our specific comment 52 on the Draft Remedial Investigation Addendum Report noted that Figure 5-4 does not clearly indicate that sampling north of the gullies provided "complete coverage". If the sampling north of the gullies has not provided "complete coverage" for metals and explosives, additional sampling in that area should include these parameters.	Our response to specific comment 52 will be that sampling north of the ditch that intercepts the gullies did occur during the previous investigation and that the figures will be revised accordingly. However, to ensure "complete coverage" we have revised the Letter Workplan to include additional sampling of the gullies to the north of the manmade ditch for metals and explosives analysis.

Tooele Army Depot—North Area
Phase II Remedial Investigation

Final Letter Work Plan
for
Additional Fieldwork - SWMUs 6, 8, and 40

December 1995

Rust Environment and Infrastructure
Grand Junction, Colorado 81506

Prepared for
U.S. Army Environmental Center
Aberdeen Proving Ground, Maryland 21010-5401
Under Contract No. DAAA15-90-0007

Contents

Appendices

Figures

Tables

Acronyms and Abbreviations

CRLs	certified reporting limits
H&S	health and safety
HASP	Health and Safety Plan
HPLC	high pressure liquid chromatography
HQ	hazard quotient
ICP	inductively coupled plasma
LWP	letter work plan
OU	operable unit
RI	Remedial Investigation
Rust E&I	Rust Environment and Infrastructure
SVOCs	semi-volatile organic compounds
SWMU	solid waste management unit
TEAD-N	Tooele Army Depot—North Area
UDEQ	Utah Department of Environmental Quality
USAEC	U.S. Army Environmental Center
USEPA	U.S. Environmental Protection Agency
UXO	unexploded ordnance

1.0 INTRODUCTION

Rust Environment and Infrastructure (Rust E&I) is currently conducting a Phase II Remedial Investigation (RI) for 11 solid waste management units (SWMUs) in 3 operable units (OUs) at Tooele Army Depot—North Area (TEAD-N) under Contract DAA15-90-0007, Modification 3 to Task Order 0003. As part of the Phase II RI, Rust E&I previously prepared and submitted a draft RI Addendum report (Rust E&I 1995). On the basis of the conclusions and recommendations, along with comments received from the U.S. Army Environmental Center (USAEC), the U.S. Environmental Protection Agency (USEPA) Region VIII, and the Utah Department of Environmental Quality (UDEQ), data gaps were identified at three SWMUs. A scope of work has been identified for additional fieldwork at the Old Burn Area (SWMU 6), the Small Arms Firing Range (SWMU 8), and the AED Test Range (SWMU 40). This letter work plan (LWP) presents the scope of the additional field work that Rust E&I will be conducting during this environmental investigation.

The work conducted during this investigation will adhere to all applicable previously approved TEAD-N RI work plans, as per USAEC direction. However, some additions to the field-operating procedures, the analytical methods and associated analytical certified reporting limits (CRLs), and the health and safety (H&S) requirements are required. These additions are presented in this LWP, detailing the updates or recommended changes.

2.0 SCOPE OF WORK FOR DATA-GAP FIELD INVESTIGATIONS

Additional fieldwork at the three above-mentioned SWMUs will include test-pit, auger boring, and surface soil sampling; unexploded ordnance (UXO) surveys; and mapping of visual observations of propellant, UXO, and debris. The additional work is designed to supplement existing data at each SWMU to further define the vertical and horizontal extent of contamination and to assess potential risks to human health and the environment associated with this contamination. The proposed work at each SWMU is discussed in the following scope of work and summarized in Table 1. The proposed work includes the following:

- Surface and subsurface soil sampling for dioxins/furans and sediment sampling for metals and explosives at SWMU 6
- Surface and subsurface soil sampling of the overshot area behind the second bullet stop at SWMU 8 for metals
- Mapping of the distribution of propellant, debris, and UXO at SWMU 40, excavation and sampling of test pits where the previous explosives data results were rejected, and sampling and analysis of soils located beneath fragments of propellant material

Analytical parameters for this investigation are listed in Table 2, including the laboratory methods and CRLs and/or method detection limits, as appropriate. One-hundred percent data validation will be performed on all methods or individual analytes that are not USAEC performance-demonstrated. All analyses that are performed by USAEC methods and have established CRLs will have 20 percent data validation performed beyond the computerized validation conducted by the IRDMIS computer system.

Table 1. Summary of Proposed Additional Sampling

Sample Site and Type	No. of Samples	Analytical Suite					
		Dioxin/Furans[a]	Metals[b]	Explosives[c]	Anions[d]	Cyanide	Propellant[e]
SWMU 6							
Surface Soils	28 + 2 field duplicates	x					
Sediments	8		x	x			
4 test pits - 3 samples per excavation (0', depth of buried debris, 2' below debris)	12	x					
Dioxin background	4	x					
SWMU 8							
Surface Soils	20 + 2 field duplicates		x				
Subsurface Soils (3' depth)	10		x				
SWMU 40							
3 test pits (depths: 0, 3, 5')	9 + 1 field duplicate			x			
Surface Soils associated with propellant	10 + 1 field duplicate			x	x	x	x
Subsurface Soils associated with propellant (2' depth)	5			x	x	x	x
QC Samples							
Field Blank	1	x	x	x	x	x	
Equipment Rinse Blanks	1 per day or 1 per 20 samples	x (approx. 4)	x (approx. 2)	x (approx. 5)	x (approx. 5)	x (approx. 5)	
MS/MSD Samples	1 pair per 20 samples or per lot						

[a]Dioxin/furan analysis will be by EPA Method 8290.
[b]Metals suite consists of Ag, Al, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, K, Mg, Mn, Na, Ni, Pb, V, Zn by ICP; As, Sb, Se, Tl by GFAA; and Hg by CVAA.
[c]Explosives suite consists of NB; 2,4-DNT; 2,6-DNT; 1,3-DNB; 1,3,5-TNB; 2,4,6-TNT; Tetryl; RDX; HMX.
[d]Anions suite consists of Nitrate/Nitrite, Sulfate, Perchlorate.
[e]Propellant suite consists of nitrocellulose, nitroglycerine/PETN, nitroguanidine, SVOCs (phthalate esters, diphenylamine, ethyl centralite).

Table 2. Laboratory Methods and Certified Reporting Limits

Parameter	Code	Method Type[a]	Soil CRL (µg/g)[b]	Soil Method Number	Water CRL (µg/L)[b]	Water Method Number
Metals and Cyanide						
Silver	AG	ICP	0.80	JS12	10.0	SS12
Aluminum	AL	ICP	11.2	JS12	112	SS12
Arsenic	AS	GFAA	2.50	B9	2.35	AX8
Barium	BA	ICP	3.29	JS12	2.82	SS12
Beryllium	BE	ICP	0.43	JS12	1.12	SS12
Calcium	CA	ICP	25.3	JS12	105	SS12
Cadmium	CD	ICP	1.20	JS12	6.78	SS12
Cobalt	CO	ICP	2.50	JS12	25.0	SS12
Chromium	CR	ICP	1.04	JS12	16.8	SS12
Copper	CU	ICP	2.84	JS12	18.8	SS12
Cyanide	CYN	Colorimetric	0.25	KF15	5.0	TF34
Iron	FE	ICP	6.66	JS12	77.5	SS12
Mercury	HG	CVAA	0.05	Y9	0.10	CC8
Potassium	K	ICP	131	JS12	1,240	SS12
Magnesium	MG	ICP	10.1	JS12	135	SS12
Manganese	MN	ICP	9.87	JS12	9.67	SS12
Sodium	NA	ICP	38.7	JS12	279	SS12
Nickel	NI	ICP	2.74	JS12	32.1	SS12

Footnotes at end of table.

Table 2. Laboratory Methods and Certified Reporting Limits (continued)

Parameter	Code	Method Type[a]	Soil		Water	
			CRL (μg/g)[b]	Method Number	CRL (μg/L)[b]	Method Number
Metals and Cyanide (continued)						
Lead	PB	ICP	7.44	JS12	43.4	SS12
Antimony	SB	GFAA	0.5*	7041	5.0*	7041
Selenium	SE	GFAA	0.45	JD20	2.53	SD25
Thallium	TL	GFAA	0.5*	7841	5.0*	7841
Vanadium	V	ICP	1.41	JS12	27.6	SS12
Zinc	ZN	ICP	2.34	JS12	18.0	SS12
Explosives						
1,3,5-Trinitrobenzene	135TNB	HPLC	0.9220	LW23	0.2100	UW25
1,3-Dinitrobenzene	13DNB	HPLC	0.5040	LW23	0.4580	UW25
2,4,6-Trinitrotoluene	246TNT	HPLC	2.0000	LW23	0.4260	UW25
2,4-Dinitrotoluene	24DNT	HPLC	2.5000	LW23	0.3970	UW25
2,6-Dinitrotoluene	26DNT	HPLC	2.0000	LW23	0.6000	UW25
Cyclotetramethylenetetranitramine	HMX	HPLC	2.0000	LW23	0.5330	UW25
Nitrobenzene	NB	HPLC	1.1400	LW23	0.6820	UW25
Cyclonite	RDX	HPLC	1.2800	LW23	0.4160	UW25
Nitramine	TETRYL	HPLC	2.1100	LW23	0.6310	UW25

Footnotes at end of table.

Table 2. Laboratory Methods and Certified Reporting Limits (continued)

Parameter	Code	Method Type[a]	Soil		Water	
			CRL (μg/g)[b]	Method Number	CRL (μg/L)[b]	Method Number
Dioxins/Furans						
Total Tetrachlorodibenzodioxins	TCDDs (Total)	High-Res. GC-MS	0.30 pg/g[c]	8290	2.0 pg/L[d]	8290
2,3,7,8-Tetrachlorodibenzodioxins	2,3,7,8-TCDD	High-Res. GC-MS	0.19 pg/g	8290	2.0 pg/L	8290
Total Pentachlorodibenzodioxins	PeCDDs (Total)	High-Res. GC-MS	1.9 pg/g	8290	19 pg/L	8290
1,2,3,7,8-Pentachlorodibenzodioxin	1,2,3,7,8-PeCDD	High-Res. GC-MS	0.38 pg/g	8290	4.2 pg/L	8290
Total Hexachlorodibenzodioxins	HxCDDs (Total)	High-Res. GC-MS	0.24 pg/g	8290	2.9 pg/L	8290
1,2,3,4,7,8-Hexachlorodibenzodioxin	1,2,3,4,7,8-HxCDD	High-Res. GC-MS	0.24 pg/g	8290	2.9 pg/L	8290
1,2,3,6,7,8-Hexachlorodibenzodioxin	1,2,3,6,7,8-HxCDD	High-Res. GC-MS	0.23 pg/g	8290	2.7 pg/L	8290
1,2,3,7,8,9-Hexachlorodibenzodioxin	1,2,3,7,8,9-HxCDD	High-Res. GC-MS	0.23 pg/g	8290	2.8 pg/L	8290
Total Heptachlorodibenzodioxins	HpCDDs (Total)	High-Res. GC-MS	0.30 pg/g	8290	2.6 pg/L	8290
1,2,3,4,6,7,8-Heptachlorodibenzodioxin	1,2,3,4,6,7,8-HpCDD	High-Res. GC-MS	0.25 pg/g	8290	2.6 pg/L	8290
Octachlorodibenzodioxin	OCDD	High-Res. GC-MS	1.2 pg/g	8290	7.0 pg/L	8290

Footnotes at end of table.

Table 2. Laboratory Methods and Certified Reporting Limits (continued)

Parameter	Code	Method Type[a]	Soil		Water	
			CRL (μg/g)[b]	Method Number	CRL (μg/L)[b]	Method Number
Dioxins/Furans (continued)						
Total Tetrachlorodibenzofurans	TCDFs (Total)	High-Res. GC-MS	0.16 pg/g	8290	1.4 pg/L	8290
2,3,7,8-Tetrachlorodibenzofuran	2,3,7,8-TCDF	High-Res. GC-MS	0.16 pg/g	8290	1.4 pg/L	8290
Total Pentachlorodibenzofurans	PeCDFs (Total)	High-Res. GC-MS	1.3 pg/g	8290	3.8 pg/L	8290
1,2,3,7,8-Pentachlorodibenzofuran	1,2,3,7,8-PeCDF	High-Res. GC-MS	0.23 pg/g	8290	2.8 pg/L	8290
2,3,4,7,8-Pentachlorodibenzofuran	2,3,4,7,8-PeCDF	High-Res. GC-MS	0.20 pg/g	8290	2.5 pg/L	8290
Total Hexachlorodibenzofurans	HxCDFs (Total)	High-Res. GC-MS	0.14 pg/g	8290	2.2 pg/L	8290
1,2,3,4,7,8-Hexachlorodibenzofuran	1,2,3,4,7,8-HxCDF	High-Res. GC-MS	0.090 pg/g	8290	1.4 pg/L	8290
1,2,3,6,7,8-Hexachlorodibenzofuran	1,2,3,6,7,8-HxCDF	High-Res. GC-MS	0.11 pg/g	8290	1.7 pg/L	8290
2,3,4,6,7,8-Hexachlorodibenzofuran	2,3,4,6,7,8-HxCDF	High-Res. GC-MS	0.12 pg/g	8290	1.9 pg/L	8290
1,2,3,7,8,9-Hexachlorodibenzofuran	1,2,3,7,8,9-HxCDF	High-Res. GC-MS	0.14 pg/g	8290	2.2 pg/L	8290
Total Heptachlorodibenzofurans	HpCDFs (Total)	High-Res. GC-MS	0.13 pg/g	8290	1.5 pg/L	8290
1,2,3,4,6,7,8-Heptachlorodibenzofuran	1,2,3,4,6,7,8-HpCDF	High-Res. GC-MS	0.094 pg/g	8290	1.1 pg/L	8290

Footnotes at end of table.

Table 2. Laboratory Methods and Certified Reporting Limits (continued)

Parameter	Code	Method Type[a]	Soil		Water	
			CRL (μg/g)[b]	Method Number	CRL (μg/L)[b]	Method Number
1,2,3,4,7,8,9-Heptachlorodibenzofuran	1,2,3,4,7,8,9-HpCDF	High-Res. GC-MS	0.13 pg/g	8290	1.5 pg/L	8290
Octachlorodibenzofuran	OCDF	High-Res. GC-MS	0.32 pg/g	8290	3.6 pg/L	8290
Anions						
Nitrate/Nitrite	NIT	Colorimetric	1.00	KF17	10.0	LL8
Perchlorate	PER	IC	5.0‡	—	0.5‡	—
Sulfate	S04	IC	5.0	KT07	175	TT09
Propellant Suite						
Nitrocellulose	NC	Colorimetric	2.3	LF05	23.1	UF05
Nitroglycerin	NG	HPLC	0.51	LW27	1.49	UW27
Nitroguanidine	NQ	HPLC	0.0447	LW30	21.1	UW29
PETN	PETN	GC/MS	1.00	LW27	2.00	UW27
Bis(2-ethylhexyl) phthalate	B2EHP	GC/MS	0.48	LM25	7.7	UM25
Butyl benzyl phthalate	BBZP	GC/MS	1.8	LM25	28	UM25
Diethyl phthalate	DEP	GC/MS	0.24	LM25	5.9	UM25
Dimethyl phthalate	DMP	GC/MS	0.063	LM25	2.2	UM25
Di-n-butyl phthalate	DNBP	GC/MS	1.3	LM25	33	UM25

Footnotes at end of table.

Table 2. Laboratory Methods and Certified Reporting Limits (continued)

Parameter	Code	Method Type[a]	Soil		Water	
			CRL (μg/g)[b]	Method Number	CRL (μg/L)[b]	Method Number
Di-n-octyl phthalate	DNOP	GC/MS	0.23	LM25	1.5	UM25
Diphenylamine‡‡	DPA	GC/MS	—	LM25	—	UM25
Ethyl centralite**	—	HPLC	—	—	—	—

[a]Abbreviations for method types are GC/MS=gas chromatography/mass spectroscopy, GC/ECD=gas chromatography/electron capture detector, ICP=inductively coupled plasma spectroscopy, CVAA=cold vapor atomic absorption, HPLC=high performance liquid chromatography, IC=ion chromatography.

[b]Measurements are in micrograms per gram (μg/g) or micrograms per liter (μg/L) unless otherwise noted (i.e., dioxins/furans).

[c]Picograms per gram.

[d]Picograms per liter.

[*]Method detection limit (MDL).

[**]Ethyl centralite contains diethyl diphenyl urea (CAS #85-98-3); method development for this analyte is necessary because it is not included in the standard analyte suite for HPLC analysis.

[‡]Method not certified; value is limit of detection (LOD). Analysis will follow DataChem Laboratory internal SOP.

[‡‡]Diphenylamine will be analyzed as n-nitrosodiphenylamine (NNDPA) by LM25 (SVOCs in soil) with an estimated CRL=0.29 μg/g, and by UM25 (SVOCs in water) with an estimated CRL = 3.7 μg/L with confirmation by evaluation of mass spectrum.

Table 3 presents the proposed sample identification numbers for the areas to be sampled during the data gap field investigation. The first two characters identify the SWMU (e.g., OB= Old Burn Area) and the third denotes the sample type (e.g., P= pit). The remaining characters identify the year collected (e.g., 95=1995) and the sample number that corresponds to specific map site and depth.

2.1 OLD BURN AREA - OU 8, SWMU 6

2.1.1 Data Gap

Due to previous open burning activities at SWMU 6, a potential exists for the presence of residual concentrations of dioxins/furans. The previous Phase I and Phase II RI investigations did not evaluate whether dioxin contamination exists at SWMU 6. In addition, the draft Site-Wide Ecological Risk Assessment (Rust E&I 1995) has identified low levels of dioxins at a number of locations, and hazard quotients (HQs) calculated for these detections indicate a potential risk to ecological receptors. Due to the apparent widespread nature of low-level dioxin contamination at TEAD-N, there is a question of whether dioxins are present at SWMU 6 and, if present, whether they are related to site activities or are reflective of anthropogenic or widespread low background levels.

Surface drainages were previously sampled and analyzed for metals and explosives. An east-west trending manmade ditch intercepts these drainages. A concern is that metals and explosives contamination may be present in the drainages north of the manmade ditch.

2.1.2 Data Objectives

Surface soil samples will be used to characterize the horizontal extent of surface dioxin and furan contamination, if present. Samples collected from test pits will characterize the possible vertical migration and vertical extent of contamination from the burned debris in the former open trenches. Background samples will assess the possibility of anthropogenic background levels of detectable dioxins, for comparison with site samples. Very low detection limits are required for use of the data in the human health risk assessment.

Sediment samples from four surface drainages collected north of the manmade ditch will be analyzed for metals and explosives to determine if off-site migration of contaminants may have occurred prior to construction of the intercept ditch.

2.1.3 Technical Approach

Twenty-eight surface soil samples for dioxin/furan analysis will be collected over the entire SWMU to determine if previous burning activities resulted in dioxin/furan contamination. The surface soil locations will be determined using an approximate north/south and east/west 200-by-200-foot grid pattern for coverage of the entire area, including the area north of the gullies.

Table 3. Sample Identification Numbers

SWMU	Abbreviation	Sample Type	Sample Depth	Sample ID No.
Old Burn Area (SWMU 6)	OB	Surface Soil	0-6"	OBS-95-01 through OBS-95-28
		Sediment	0-6"	OBS-95-29 through OBS-95-36
		Test Pit	0-6"	OBP-95-01a through OBP-95-04a
			Depth of Debris	OBP-95-01b through OBP-95-04b
			2' Below Debris	OBP-95-01c through OBP-95-04c
		Surface Soil (Background)	0-6"	OBK-95-01 through OBK-95-04
Small Arms Firing Range (SWMU 8)	SA	Surface Soils	0-6"	SAS-95-01 through SAS-95-10
		Soil Borings	0-6"	SAB-95-01a through SAB-95-10a
			3'	SAB-95-01b through SAB-95-10b
AED Test Range (SWMU 40)	AR	Test Pits	0-6"	ARP-95-01a through ARP-95-03a
			3'	ARP-95-01b through ARP-95-03b
			5'	ARP-95-01c through ARP-95-03c
		Surface Soils	0-6"	ARS-95-01a through 10a
		Soil Borings	2'	ARB-95-01b through ARB-95-05b
Field Blank	FB	Field Blank		3FB-P
Equipment Rinses	ER	Rinse Blank		3ER-65 through 3ER-85, or as required for total number of rinse blanks collected

Twenty-eight grid locations will be randomly selected for sampling based on this grid pattern (Figure 1).

Four test pits will be excavated. The locations for these test pits will be selected based on the locations of Phase II test pits, which encountered buried debris showing indications of burning. The new test pits will be placed adjacent to, but not into, previously excavated areas and will be excavated as observation pits until the presence of buried debris is confirmed. Upon confirmation of burned debris, soil samples will be collected at the surface, within the zone of buried debris, and 2 feet below the depth of burial.

Eight surface sediment locations will be selected in four surface drainage areas north of the manmade ditch for metals and explosives analysis as shown in Figure 1.

To address the issue of anthropogenic or widespread background levels of detectable dioxins, four background surface soil samples will be collected. The locations of these samples will be in the vicinity of SWMU 6, but to the east and the west of the SWMU in order to be out of the dominant wind direction patterns. Care will be taken to select locations with the same soil type (Hiko Peak gravelly loam) as is found at SWMU 6.

Analysis of all soil samples, both surface and subsurface, will be for dioxins/furans, using USEPA SW-846 Method 8290, High Resolution Gas Chromatography/Mass Spectrometry. Sediment samples will be analyzed for metals using a USAEC performance-demonstrated inductively coupled plasma (ICP) method and explosives using a USAEC performance-demonstrated high pressure liquid chromatography (HPLC) method (see Table 2). UXO clearance will be performed during test pit activities. Any UXO encountered will be documented as to type, quantity, and disposition (e.g., removal, in-place detonation).

2.2 SMALL ARMS FIRING RANGE - OU 9, SWMU 8

2.2.1 Data Gap

Due to the possibility of previous overshooting of the second bullet stop, the potential exists for metals contamination and debris from projectiles to be found in the area south of the firing range. This area was not investigated in the Phase I and Phase II investigations because it was assumed that the majority of the potential contamination would be restricted to the two bullet stops.

2.2.2 Data Objectives

The horizontal extent of metals contamination from potential overshot at the firing range will be addressed by the surface soil samples. The vertical extent of metals contamination will be addressed by the analysis of subsurface samples.

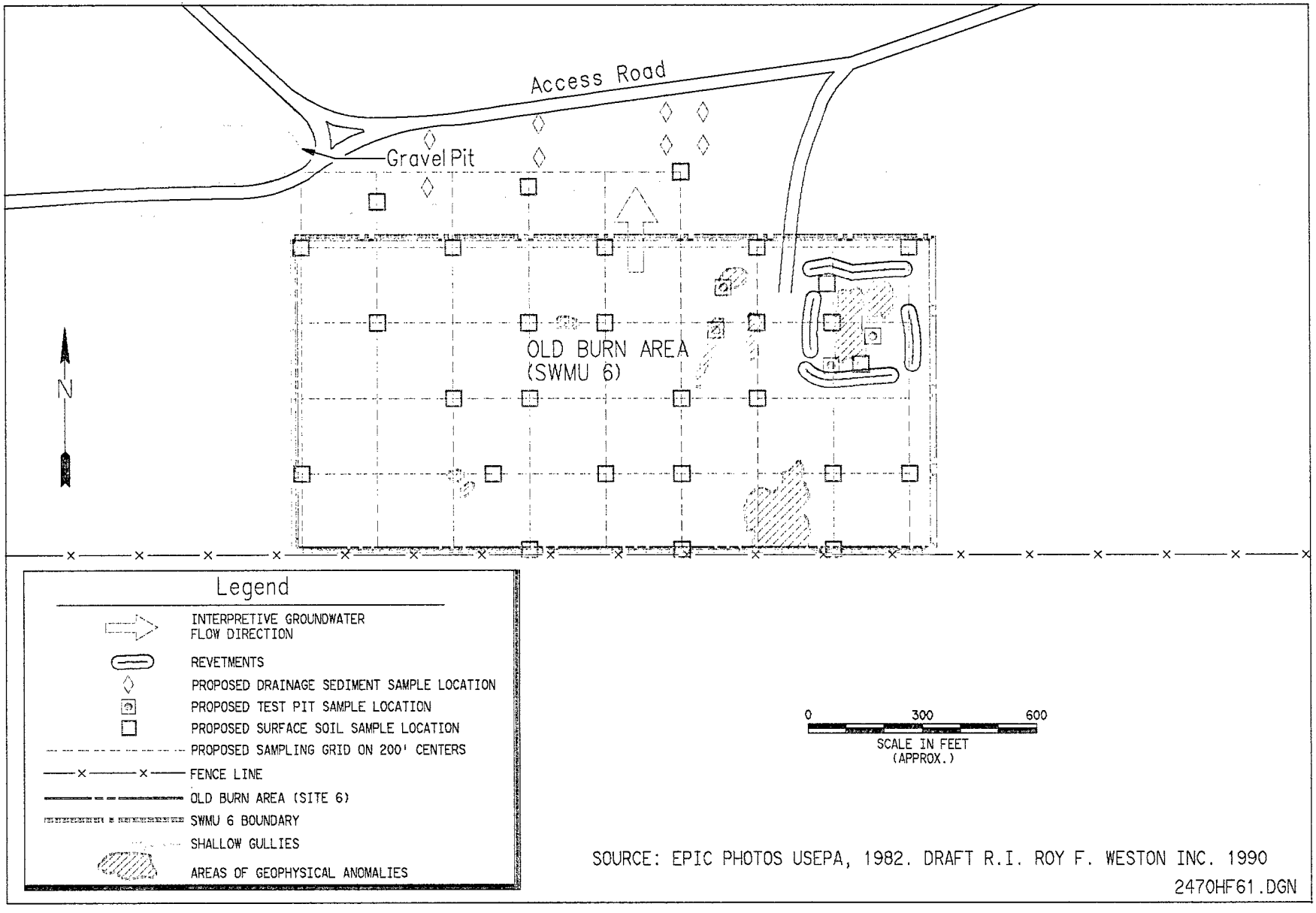

Figure 1. Proposed Drainage Sediment, Surface Soil, and Test Pit Locations, Old Burn Area (SWMU 6)

2.2.3 Technical Approach

Twenty surface soil samples will be collected in the overshot area, behind (south of) the second bullet stop, in order to characterize this area, which was not addressed during the Phase I and Phase II investigations. The surface soil locations will be determined using an approximate north/south and east/west square grid pattern for coverage of the entire area (Figure 2). In addition, at 10 of the surface soil sample locations, subsurface soil samples, hand augered to a depth of 3 feet, will be collected to address possible vertical migration of contamination. All samples will be analyzed for total metals.

2.3 AED TEST RANGE - OU 9, SWMU 40

2.3.1 Data Gap

Specific comments from both the USEPA Region VIII and the UDEQ identified concerns as to the chemical composition of the solid rocket propellant material, which has been noted on the ground in numerous areas of the SWMU. In addition, the comments raised concerns as to whether the propellant could pose a risk or hazard to human health or the environment if allowed to remain at the site. The propellant material had not been sampled in previous investigations.

Due to the rejection of one entire lot of explosives data, the analytical data for samples collected from four Phase II test pits were lost. These four test pits were excavated in an area that displayed evidence of cratering, indicating detonations had taken place.

2.3.2 Data Objectives

Analytical information obtained from TEAD on the composition of the propellant (see Appendix A) and analysis of soils beneath the propellant material for potential contaminants leaching from the propellant will be evaluated in the risk assessment. Visual mapping of the propellant material and other debris will assess the horizontal extent of this surface contamination. Explosives data for four test pits that were rejected due to poor recoveries will be replaced.

2.3.3 Technical Approach

Interviews with TEAD-AED personnel were conducted by Rust E&I and the Organic Analysis Department at DataChem Laboratories, Inc., Salt Lake City, Utah, to obtain information on the composition of the propellant material. Dr. Bishop of TEAD-AED identified three possible recipes for the materials that were known to be tested at SWMU 40. The compositions of the various mixtures are provided in Appendix A.

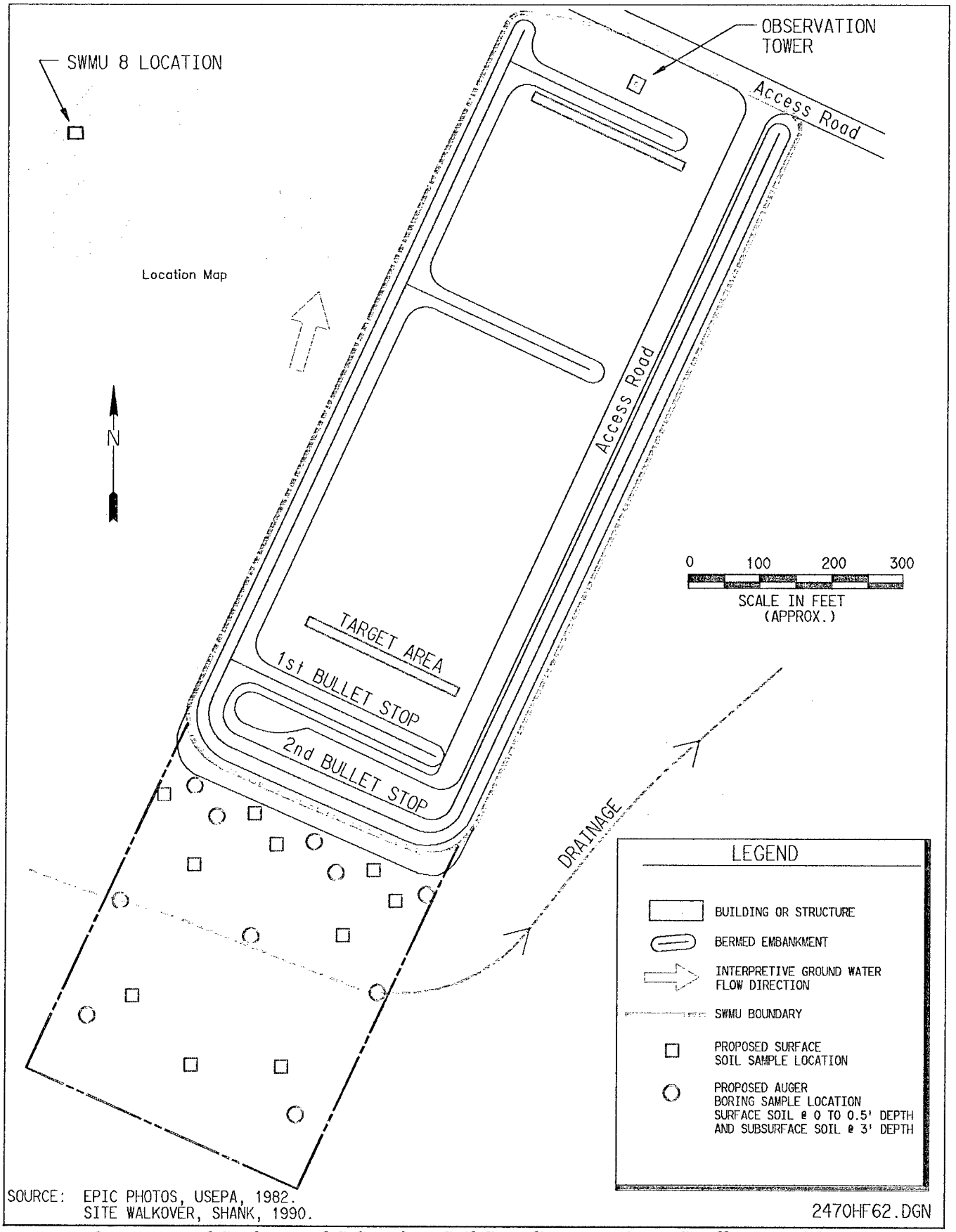

Figure 2. Proposed Surface and Subsurface Soil Sampling Locations, Small Arms Firing Range (SWMU 8)

Working with Mr. Ken Rhea of TEAD-AED, the Rust E&I field operations leader has confirmed the visual identification of the material suspected of being propellant and photographed the confirmed propellant material to aid in future survey activities. Mr. Rhea has stated that the Army (1) has previously conducted controlled burn tests on this material to confirm its identity and (2) is able to identify the material in the field.

Visual observation will be conducted to identify areas where propellant, UXO, or debris remain on the ground. There is concern that allowing this material to remain could pose a risk to human health or to the environment under possible future use scenarios. Working with UXO support, Rust E&I personnel will walk on grid lines of the SWMU and will record all material encountered as to the identity of the material and the location. Locations will be determined using a tape-and-compass along the established grid lines, with test pit monuments constructed in the Phase II excavations serving as control points. The locations of these test pit monuments were established by a licensed surveying firm following the 1994 field investigation. The procedure for this mapping is provided in Appendix B.

Ten areas of propellant will be identified based on the mapping. A surface soil sample will be collected immediately under the location of the propellant identified at each of the 10 areas. For one-half of the surface soil sample locations, a subsurface sample will be collected using a hand auger from a 2-foot depth. The soil samples will be submitted for chemical analysis in order to characterize the possible decomposition of the propellant material or leaching of contaminants into the soil. The samples will be analyzed for explosives, cyanide, anions (nitrate/nitrite, sulfate, and perchlorate), and a suite of analytes expected to be related to the propellant material (nitrocellulose, nitroglycerine/PETN, nitroguanidine, and selected semi-volatile organic compounds (SVOCs): phthalate esters, diphenylamine, ethyl centralite).

Three test pits will be excavated in the area of Phase II test pits 22, 23, 24, and 25 (Figure 3), and sampled for explosives analysis. These samples are intended to replace the data from the four test pits where all the explosives data were lost due to rejection of one entire lot. The three new test pits will be excavated adjacent to, but not into, the disturbed areas of the original four test pits. Samples will be collected at three depths (surface, 3 feet, and 5 feet) in each of the three test pits. All samples will be analyzed for explosives. UXO clearance will be performed during test pit activities.

Any UXO encountered during field activities at SWMU 40 will be documented as to location, type, quantity, and final disposition.

3.0 FIELD OPERATING PROCEDURES

The procedure for field mapping visual observations of debris and propellant is presented in Appendix B. All other field activities will follow the field procedures and utilize the field data forms, which are presented in Appendix A, Volume I of the previously approved *Final Work Plan for Phase II Remedial Investigation and Site-Wide Ecological Assessment for TEAD-N* (Rust E&I 1994).

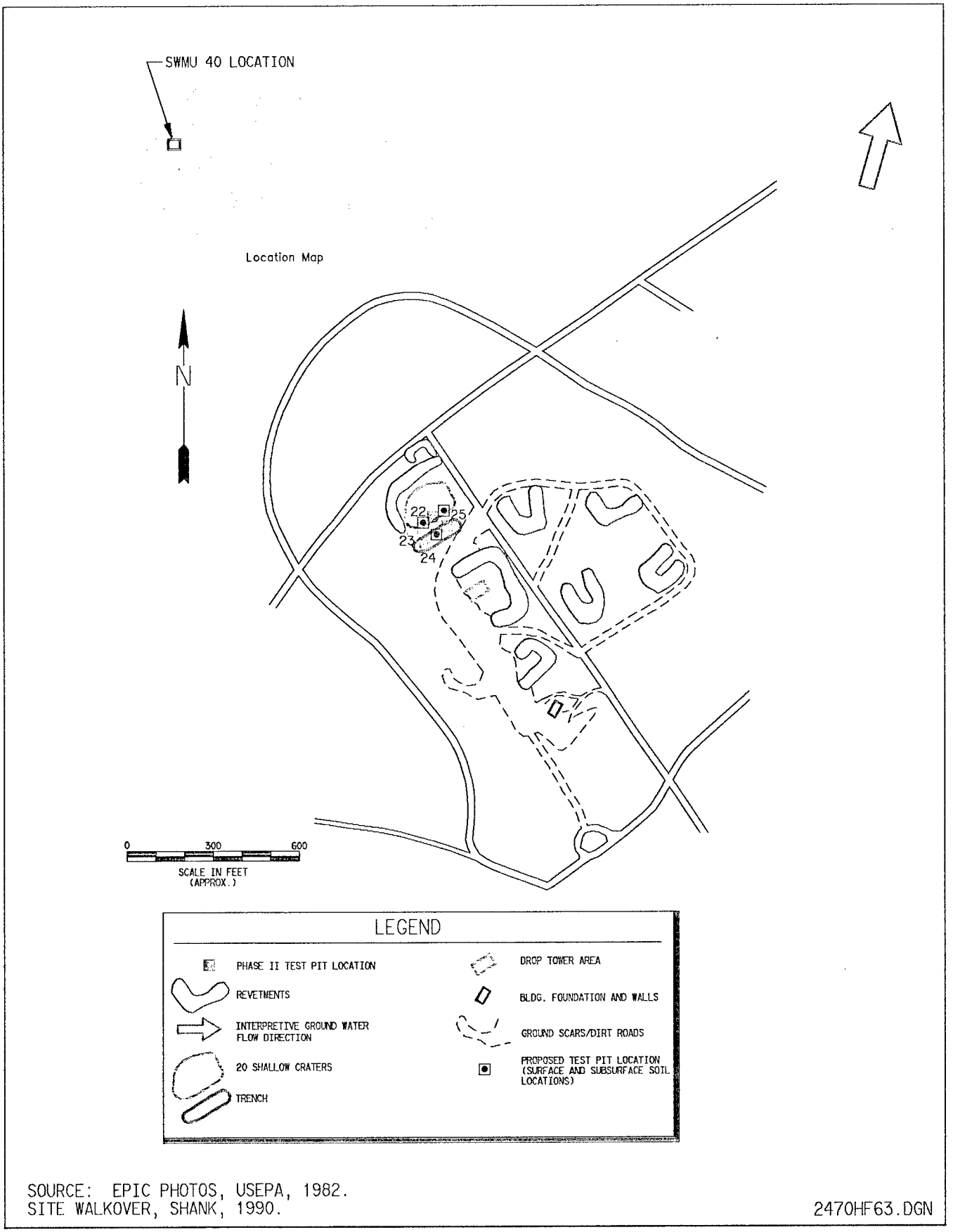

Figure 3. Proposed Test Pit Locations, AED Test Range (SWMU 40)

4.0 HEALTH AND SAFETY PROCEDURES

The activities that are to be performed at TEAD-N, Task Order 0003, will not require a change to the existing Health and Safety Plan (HASP) at this time. If there are tasks which have not been discussed in the current HASP, a HASP modification form will be completed describing the task and the level of protection and monitoring required.

APPENDIX A
COMPOSITION OF PROPELLANT MATERIAL

Three possible compositions were identified for the propellant material found on the surface at SWMU 40.

M-1: 84% nitrocellulose
10% 2,4-DNT
5% dibutyl phthalate
1% diphenylamine

M-7: 55% nitrocellulose
36% nitroglycerine
8% potassium perchlorate
1% ethyl centralite
1% carbon overglaze or carbon powder

M-10: 98% nitrocellulose
1% diphenyl amine
1% carbon overglaze

APPENDIX B

STANDARD OPERATING PROCEDURE FOR UXO AND PROPELLANT SURVEYING AT THE AED TEST RANGE (SWMU 40)

1.0 PURPOSE AND SCOPE

This procedure establishes the technical approach, personnel responsibilities, and methods to be used for UXO and propellant surveying at the AED Test Range (SWMU 40) at Tooele Army Depot - North Area (TEAD-N), Tooele, Utah. This procedure will be used by Rust E&I in accordance with U.S. Army requirements for UXO-related activities. All activities will be conducted utilizing a subcontractor, EOD Technologies, who specializes in the detection and identification of UXO and explosive materials.

The UXO and propellant surveying at SWMU 40 will encompass the entire SWMU wherein discrete areas will be gridded and walked to record all UXO, propellant, and other debris encountered. The results of this survey will provide additional information needed to assess potential risks to human health and the environment and to evaluate potential remedial action alternatives in support of the Remedial Investigation/Feasibility Study being conducted by Rust E&I.

2.0 APPLICABILITY

This procedure applies only to Rust E&I personnel and EOD Technologies personnel responsible for conducting the UXO and propellant field survey of SWMU 40 at TEAD-N. Due to safety concerns, no other contractor or regulatory personnel will be allowed to participate in the surveying activities. Only trained and qualified personnel will be used for this effort. Documentation of this training will be obtained and maintained in the field project files.

3.0 DEFINITIONS

3.1 UXO - Unexploded ordnance present at SWMU 40 as a result of testing activities such as open detonation of white phosphorous and smoke munitions, bomb drop testing, propagation and conveyor-spacing testing, bomb detonation (as evidenced by numerous large craters), and other munition-related testing.

3.2 PROPELLANT - Fragments of rocket propellant remaining at SWMU 40 following rocket engine testing activities.

3.3 EOD - Explosives Ordnance Disposal. EOD Technologies, Inc., will provide support to Rust E&I in all UXO and propellant detection and identification.

4.0 REFERENCES

4.1 U.S. Army 60 series EOD Publications - Provides "render safe" procedures for UXO

4.2 Rust E&I Final Health and Safety Plan for RI/FS activities at TEAD-N (1993)

4.3 Rust E&I Draft Final RI Report for TEAD-N (1994)

5.0 PROCEDURE

5.1 ESTABLISHING UXO AND PROPELLANT SURVEY GRID

5.1.1 The entire area of SWMU 40 (approximately 60 acres) will be gridded by EOD personnel on a 200-by-200-foot grid using previously established test pit monuments, roads, and revetments for control.

5.1.2 The resulting grid lines will be labeled alphanumerically with line A1 being located in the extreme northwest corner (see Figure B-1).

5.2 CONDUCTING WALKING SURVEY

5.2.1 Two EOD technicians and one Rust E&I technician will conduct the UXO and propellant survey. The Rust E&I technician will keep a logbook that records all UXO, propellant, and debris observed and identified by EOD personnel.

5.2.2 Beginning with Line A1, EOD personnel, followed by the Rust E&I technician, will begin walking south along the grid line. Information will be gathered along each 200 ft. line segment (i.e., A1 to A2, A2 to A3, etc.). As the EOD personnel encounter UXO, propellant, or debris, they will relay the description of the material to the Rust E&I technician, who will mark the location on the grid map and enter the information on the appropriate field logbook (for example, 105-mm projectile, located on line A, 33 feet south of grid point A3).

5.2.3 Any UXO encountered will be marked with a pin flag for subsequent disposal or detonation by Army EOD personnel.

5.2.4 The same procedure will be repeated for Line B1 through B6, C1 through C7, D1 though D9, E1 through E9, F2 through F9, G3 through G8, H3 through H7, and I4 through I6.

5.3 DETAILED PROPELLANT SURVEY

5.3.1 On the basis of visual observations from the walking survey, four 200-by-200-foot grid areas containing the greatest incidence of propellant will be selected for 100 percent characterization for determining propellant distribution. From previous RI activities, these grid squares are likely to include the area from the drop tower to the building foundation (i.e., C4, C5, D4, D5; C5, C6, D5, D6; D5, D6, E5, E6; and D7 D6, D7, E6, E7).

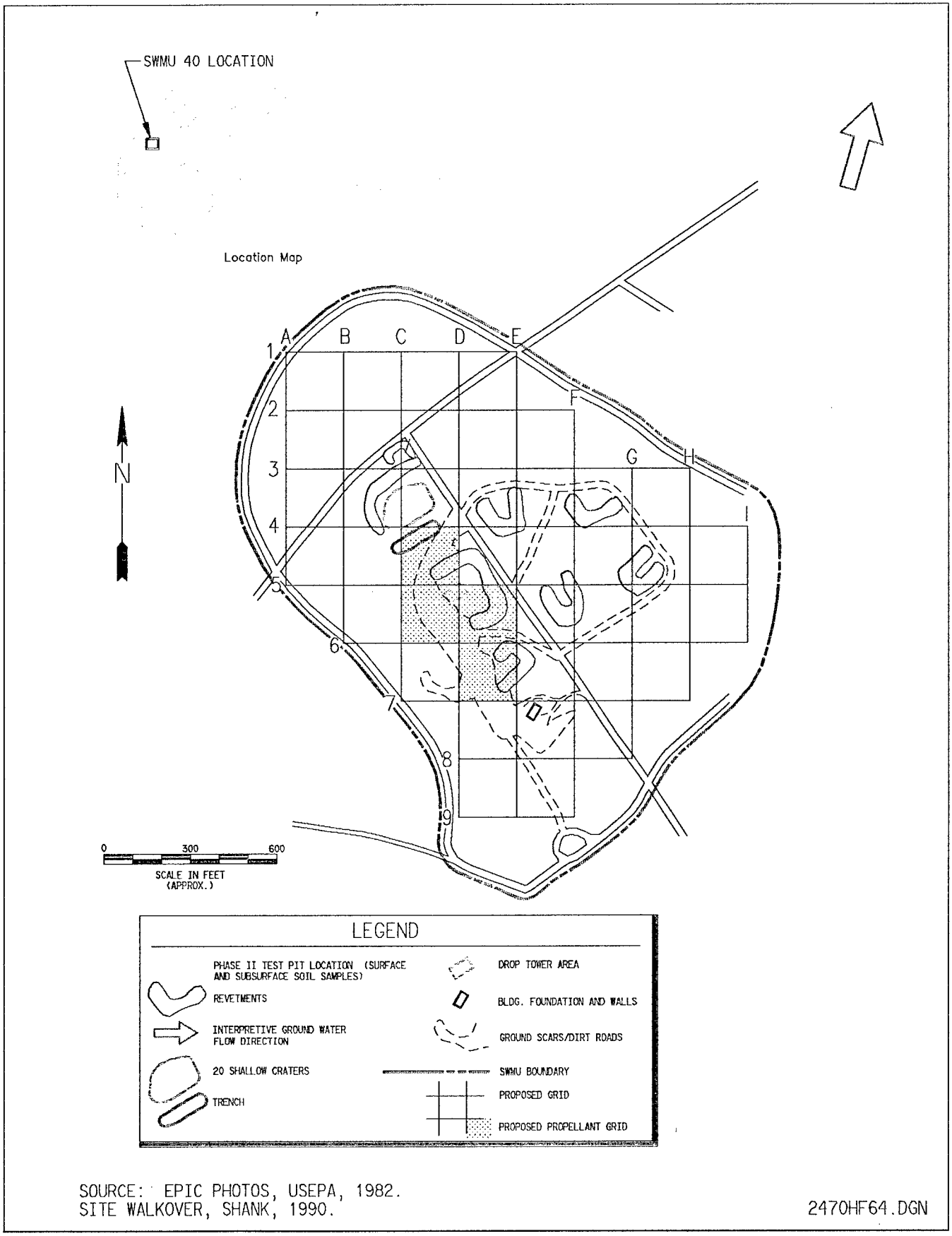

Figure B-1. Proposed UXO and Propellant Survey Grid, SWMU 40

5.3.2 The EOD personnel and Rust E&I technician will walk the entire 200-by-200-foot area within the four designated grids, looking for fragments of propellant. Each identified propellant fragment location will be marked with a pin flag that includes a location ID number.

5.3.3 Upon survey completion, the Rust E&I technician will mark each flagged location on an accurately scaled grid map showing propellant distribution in each of the four grids. In addition, the estimated size, color, and propellant type (if known) for each numbered fragment will be noted in the logbook.

6.0 RECORDS

6.1 COMPLETED UXO AND PROPELLANT SURVEY LOGBOOK

6.2 LIST OF UXO ENCOUNTERED AND LOCATION ON GRID FOR ARMY EOD PERSONNEL